

THE OPEN UNIVERSITY OF SRI LANKA
 FACULTY OF ENGINEERING TECHNOLOGY
 BACHELOR OF TECHNOLOGY – LEVEL 06
 FINAL EXAMINATION – 2005/2006
 MEX6340– INDUSTRIAL ENGINEERING

040



DATE : 26th April, 2006
 TIME : 0930-1230 hrs
 DURATION: Three (03) Hours

Answer any five (05) questions.

All questions carry equal marks.

Q1.

The maintenance division of a factory is to undertake overhauling of machinery in a particular department. The activity schedule shown in table 1 below has been prepared by the maintenance engineer.

Activity	Duration in days	Immediate predecessor Activity	Number of people required
A	4	-	3
B	1	-	2
C	4	B	4
D	5	B	2
E	2	B	3
F	5	C	3
G	2	D	4
H	6	A,E	3
I	2	H	4
J	4	F,G,I	5
K	3	J	6

Table 1

The cost per man-day is Rs. 1000.00. Activities G and I cannot be done simultaneously due to resource constraints.

You are required to:

- 1.1 Draw up a network to represent the above schedule and identify the critical activities. What is the shortest time required to complete the job?
[8 Marks]
- 1.2 Draw up a chart to show the manpower required for each day for the duration of the job and estimate the cost if the job is to be completed in the shortest possible time.
[6 Marks]
- 1.3 If the number of people available is limited to a maximum of 10 on any given day, what minimum adjustments you would make in the chart thus prepared, in response to part 1.2 of the question.
[6 Marks]

Q2.

2.1 What is linear programming? Discuss its limitations

[4 Marks]

2.2 A Pharmaceutical Manufacturing Company has a stock of 100 kg of Thiamine Hydrochloride, 180 kg of Nicotinamide, and 120 kg of Lactose Monohydrate in a given month. The company can use these active ingredients to make three types of Vitamin B complex tablets, identified as V_B-5-10-5, V_B-5-5-10 and V_B-20-5-10, where the identification number of each tablet represents the percentage by weight of Thiamine Hydrochloride, Nicotinamide and Lactose Monohydrate respectively. In addition, an inert ingredient (binding powder) is used to maintain the compactness of tablets. The cost of the ingredients is given in the table 2.

Ingredient	Cost Per kg (Rs.)
Thiamine Hydrochloride	800/=
Nicotinamide	200/=
Lactose Monohydrate	500/=
Binding powder	200/=

Table 2

Selling prices of these Vitamin B tablets as listed earlier are Rs. 405/=, Rs. 430/= and Rs. 450/= per kg respectively. There is a restriction imposed by the management of the company for the product V_B-5-10-5 so that not more than 30 kg of that particular vitamin can be produced in a month. Determine how much of each of the products they should produce in order to maximize the profit.

[16 Marks]

Q3.

3.1 Discuss the usefulness of the options 'Infinite and finite loading' in the context of Material Requirements Planning (MRP).

[4 Marks]

3.2 Discuss the meaning 'Planned order release' and 'Scheduled order receipts' used in MRP.

[4 Marks]

3.3 Product M is made up of two subassemblies identified as N and P, which are in turn made up of several subcomponents. Product M is made of 2 units of N and 3 units of P. N is made of 2 units of R and 4 units of S. R is made of 1 unit of S and 3 units of T. P is made of 2 units of T and 4 units of U.

(i) Prepare the Bill Of Materials (product structure tree) for Product M.

[4 Marks]

(ii) Lead times and stock in hand of M, N, P, R, S, T and U are given below in table 3. If 100 units of M are required in week 10 develop a planning schedule showing how much (what Quantity) and when each item should be ordered.

(Use the MRP Sheet attached at the end of the question paper)

Item	Lead times (weeks)	Stock in hand
M	1	50
N	2	60
P	2	70
R	4	100
S	2	0
T	2	0
U	1	0

Table 3

Q4. [8 Marks]

4.1 Write a brief Introduction on Ergonomics explaining why it is important and how it can help improve productivity.

[6 Marks]

4.2 Measurement is an essential requirement in managing a manufacturing process. Name the different measurements to be highlighted on display board on the factory floor.

[4 Marks]

4.3 'Quality is not just about logos, It should mainly focus on reducing operational costs and improving profits' Comment.

[4 Marks]

4.4 With examples of application, explain the principles behind 'Pareto Analysis' and 'Cause and Effect Diagrams'.

[6 Marks]

Q5.

5.1 Elimination of waste is vital for any organization. Describe the seven prominent types of wastes defined by the Toyota Production System.

[10 Marks]

5.2 Taking an example from the manufacturing or service organization, identify the types of wastes you may have come across and suggest possible methodologies to eliminate them.

[10 Marks]

Q6.

6.1 What are the long term and short term actions for improving the productivity of a production organization?

[5 Marks]

6.2 What are the motion economy principles that you will use in productivity improvement with respect to:

- Operator dexterity (body movement)
- Arrangement of work place

[6 Marks]

6.3 In an attempt to increase productivity, a company is planning to install an incentive scheme. Work-study analysts observed a worker for 30-minute period. During that time the worker completed 42 numbers of work pieces. The performance of the worker has been rated as 120%. The company standard on fatigue and personal allowance is 15%.

(i) What is the normal time for the job?

[4 Marks]

(ii) What is the standard time for the job?

[5 Marks]

Q7.

7.1 "Inventory is an unseen cost. However one cannot do without it. Inventory could be silently eating into your profits while affecting your production efficiency." Comment.

[4 Marks]

7.2 The demand for an item is 50,000 units per year and the item is used continuously at a constant rate. The ordering cost is estimated as Rs.1,000/= per order associated with one week lead time. The inventory carrying cost is Rs.10/= per unit per year and shortage cost is estimated as Rs.100/= per unit per year. Determine the EOQ, reorder level and the total cost per year if,

(i) no shortages are allowed and no buffer stock is maintained, and

[8 Marks]

(ii) a buffer stock of 1000 units is maintained.

[8 Marks]

Q8.

8.1 What is Enterprise Resource Planning (ERP)? Briefly explain the key application modules that can be found in an ERP system.

8.2 What is Supply Chain Management? Describe five basic components of Supply Chain Management.

8.3 Describe the term 'Out Sourcing' and explain why a firm would want to out source.

[20 Marks]

END

MRP SHEET FOR Q 3 (to be detached and attached to the answer script)

Item	Description	Week No.											
		1	2	3	4	5	6	7	8	9	10	11	
	Gross requirement On hand Net Requirements Planned order receipts Planned order release												
	Gross requirement On hand Net Requirements Planned order receipts Planned order release												
	Gross requirement On hand Net Requirements Planned order receipts Planned order release												
	Gross requirement On hand Net Requirements Planned order receipts Planned order release												
	Gross requirement On hand Net Requirements Planned order receipts Planned order release												
	Gross requirement On hand Net Requirements Planned order receipts Planned order release												
	Gross requirement On hand Net Requirements Planned order receipts Planned order release												